APPENDIX D
COMMUNICATIONS TESTS

D. COMMUNICATIONS TESTS

This appendix provides detailed information on all of the communications tests which will be conducted prior to the SM2. This information includes objectives of each test, resource requirements (personnel, facilities, software, hardware, etc.), and projected test schedules. Each test session was created to ensure that all test objectives and requirements covered by this appendix are verified.

D.1 PERFORMANCE DEMONSTRATION TEST - 1 (AFT FLIGHT DECK(AFD) COMMAND AND TELEMETRY TEST)

This Section provides detail information on the Performance Demonstration Test - 1 (Aft Flight Deck (AFD) Command and Telemetry Test).

D.1.1 Purpose

PDT-1 is a string test which exercises the STS-82 software for commands and telemetry. PDT-1 will consist of four test sessions described in detail below.

D.1.2 Objectives

This testing will checkout the AFD telemetry processing of HST telemetry and the AFD commands which may be sent to HST during the SM2.

- Command:
  - Single and multiple command blocks from the AFD
- Telemetry:

- 500 bps S, 4 Kbps D/A, 32 Kbps T/H engineering data

D.1.3 Activities

Test session 1 will occur at GSFC in the VEST facility. The purpose of this test session is to record HST telemetry and vary the parameters that will be displayed on the AFD.

Test session 2 will occur at KSC in the **Cargo Interrogation Test Equipment (**CITE**)** facility. This test session will play the tape recorded in test session 1 to the CITE Orbiter avionics and displays. The results will be video taped and compared to expected results.

Test session 3 will occur at KSC in the CITE facility. The purpose of this test session is to record HST commands executed from the AFD.

Test session 4 will occur at GSFC in the VEST facility. This test session will play the tape recorded in test session 3 to the VEST equipment. The telemetry responses to the commands will be documented compared to expected results.

Refer to Figure D-1 for an illustration of the PDT-1 test configuration.

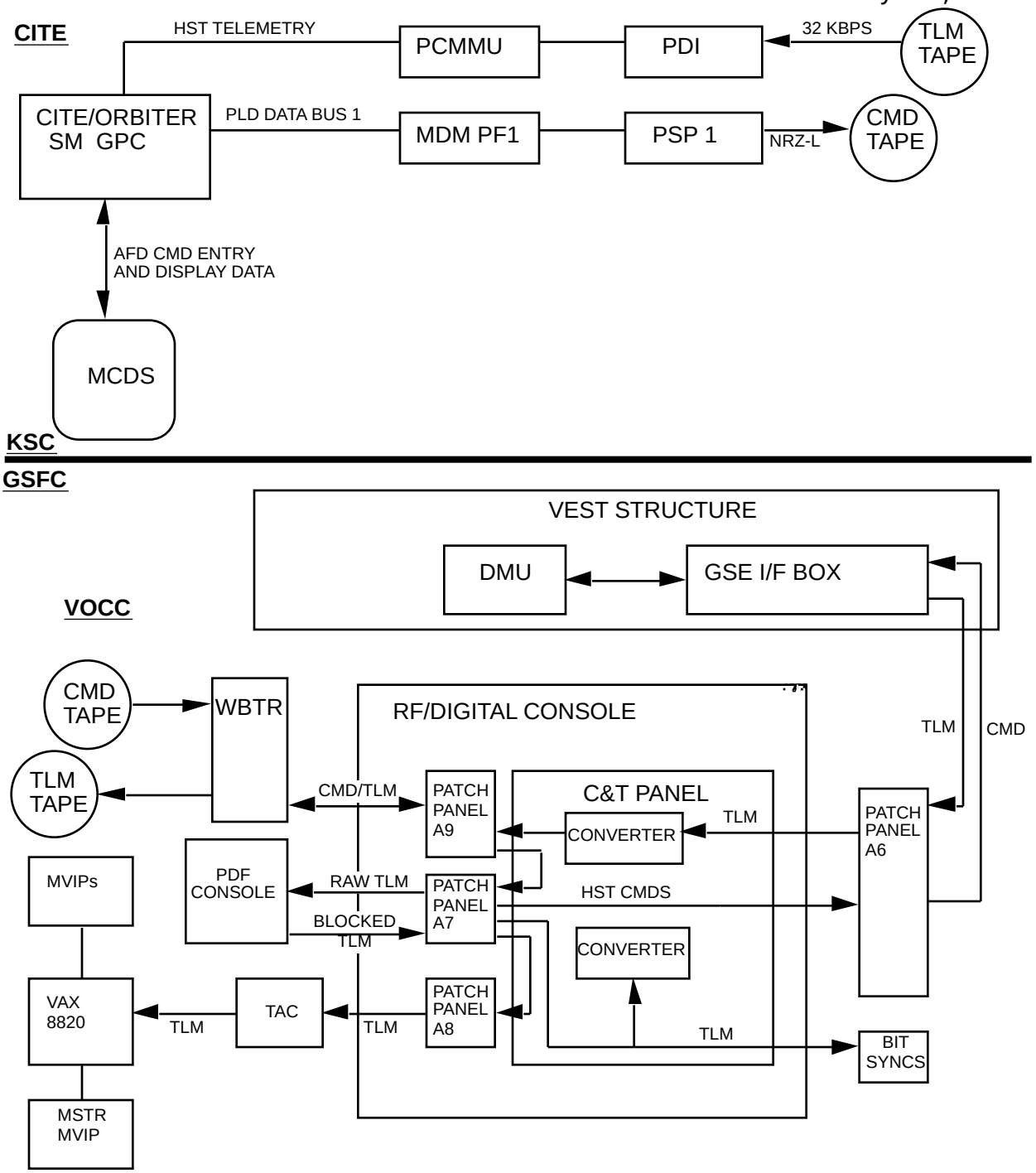

Figure D-1. PDT-1 Configuration

D.1.4 Roles and Responsibilities

This Section identifies the Performance Demonstration Test - 1 (Aft Flight Deck (AFD) Command and Telemetry Test) support roles and responsibilities.

D.1.4.1 Simulation Operations Center. The SOC located in Building 25 at GSFC will provide personnel to operate a HST simulator to record telemetry that is not available at the VEST due to hardware or system constraints. The SOC personnel will be responsible for reviewing the test procedures and configuration.

D.1.4.2 Cargo Interrogation Test Equipment. The Cargo Interrogation Test Equipment (CITE) located in the O&C building at KSC will provide personnel to operate an Orbiter simulator to receive HST telemetry from a tape and to execute HST commands from the AFD. The CITE personnel will be responsible for reviewing procedures, preparing the KSC test procedures, scheduling, and operating the equipment at the CITE.

D.1.4.3 Vehicle Electrical System Test. The VEST located in Building 29 at GSFC will provide personnel to operate a HST simulator and/or HST hardware to record telemetry to a tape and to receive commands from a tape recorded at CITE. The VEST personnel will be responsible for reviewing procedures, scheduling and operating the equipment at the VEST.

D.1.4.4 Code 441/510. Code 510 personnel will coordinate, lead, and support analysis of the test activities and results. Code 441 will provide system engineering support to assist in analysis of the output products.

D.1.4.5 Data Evaluation Laboratory. The Data Evaluation Laboratory (DEL) will be responsible for providing personnel to edit and make copies for HST data tapes for distribution to various test elements.

D.1.5 System/Facility Requirements.

This Section identifies the Performance Demonstration Test - 1 (Aft Flight Deck (AFD) Command and Telemetry Test) hardware and software. (See Table D-1).

Table D-1. PDT-1 **Facilities**

PDT-3 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
SOC	BLDG. 25	PORTABLE SPACECRAFT SIMULATOR AND BLOCKERS/DEBLOCKERS
CITE	O&C BLDG.	STS-82 ORBITER SOFTWARE AND ORBITER SIMULATORS
VEST	BLDG. 29	VEST STRUCTURE AND VEST APs/MVIPs/TTACs
DEL	BLDG. 25	TAPE FORMATTER AND PLAYBACK EQUIPMENT

D.1.5.1 Simulation Operations Center. The SOC located in Building 25 at GSFC will provide a HST simulator to record telemetry that is not available at the VEST due to hardware or system constraints. This tape will supplement the VEST tape to be exercised at the CITE facility.

D.1.5.2 Cargo Interrogation Test Equipment. CITE located in the O&C building at KSC will provide personnel and an Orbiter

simulator to receive HST telemetry from a tape and to execute HST commands from the AFD.

D.1.5.3 Vehicle Electrical System Test. The VEST located in Building 29 at GSFC will provide a HST simulator and/or HST hardware to record telemetry to a tape. The VEST will also provide the HST simulator and/or HST hardware to receive commands from a tape recorded at CITE.

D.1.5.4 Data Evaluation Laboratory. The Data Evaluation Laboratory (DEL) will construct a single tape from the recordings made at the VEST and SOC for playback at the CITE facility. The DEL will also verify tape quality.

D.1.6 Duration

Test Session 1 - 12 hours at GSFC VEST facility
Test Session 2 - 4 hours at KSC CITE facility
Test Session 3 - 4 hours at KSC CITE facility
Test Session 4 - 12 hours at GSFC VEST facility

D.1.7 Dependencies

Dependencies for this test include:

- HST telemetry (simulated by the SOC's Portable Spacecraft Simulator (PSS) and VEST)
- Orbiter AFD commands (simulated by CITE)

D.1.8 Schedule

These are the planned dates for PDT-1 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 6/1/96
- Test Plan/ Procedure (Final)..... 6/15/96

- Vest record AFD telemetry..... 7/15/96
- SAIL AFD CMD/TLM test..... 9/30/96
- AFD CMD/TLM test at KSC..... 11/10/96
- VEST playback of AFD CMDs..... 11/17/96

- Test Report (Draft)..... 10/15/96
- Test Report (Final)..... 11/24/96

D.2 PERFORMANCE DEMONSTRATION TEST -2 (CITE INTERFACE VERIFICATION TEST)

This section provides detail information on the Performance Demonstration Test - 2 (CITE Interface Verification Test).

D.2.1 Purpose

PDT-2 is a string test which will verify the Orbiter (simulated by CITE) to HST and Shuttle Support Equipment (SSE) interfaces. PDT-2 will consist of a single test session.

D.2.2 Objectives

The test will verify the Orbiter (simulated by CITE), HST (simulated by GSFC GSE), and SSE interfaces for STS-82 AFD command and telemetry.

- Command:
  - AFD command to SSE
  - AFD command to HST (simulated by GSFC GSE)
- Telemetry:
  - Simulated HST 500 bps S, 4 Kbps D/A, 32 Kbps T/H engineering data
  - Simulated HST 4 Kbps DF224 dump data
  - SSE T-0 connections

D.2.3 Activities

The test is incorporated into the CITE Interface Verification Test which occurs locally at KSC. The HST PSS and Radio Frequency (RF) Simulator rack will provide the interfaces for all HST commands and telemetry. The commands will be verified at the PSS and telemetry responses will be verified on the AFD. All test activities will be incorporated into the KSC Operations Maintenance Instructions (OMI) for this test.

Refer to Figure D-2 for an illustration of the PDT-2 test configuration.

D.2.4 Roles and Responsibilities

This Section identifies the Performance Demonstration Test - 2 (CITE Interface Verification Test) support roles and responsibilities.

D.2.4.1 Kennedy Space Center. KSC will provide personnel, plan/ procedures, and lead all activities during this test.

10/30/95

CITE Performance Demonstration Test 2

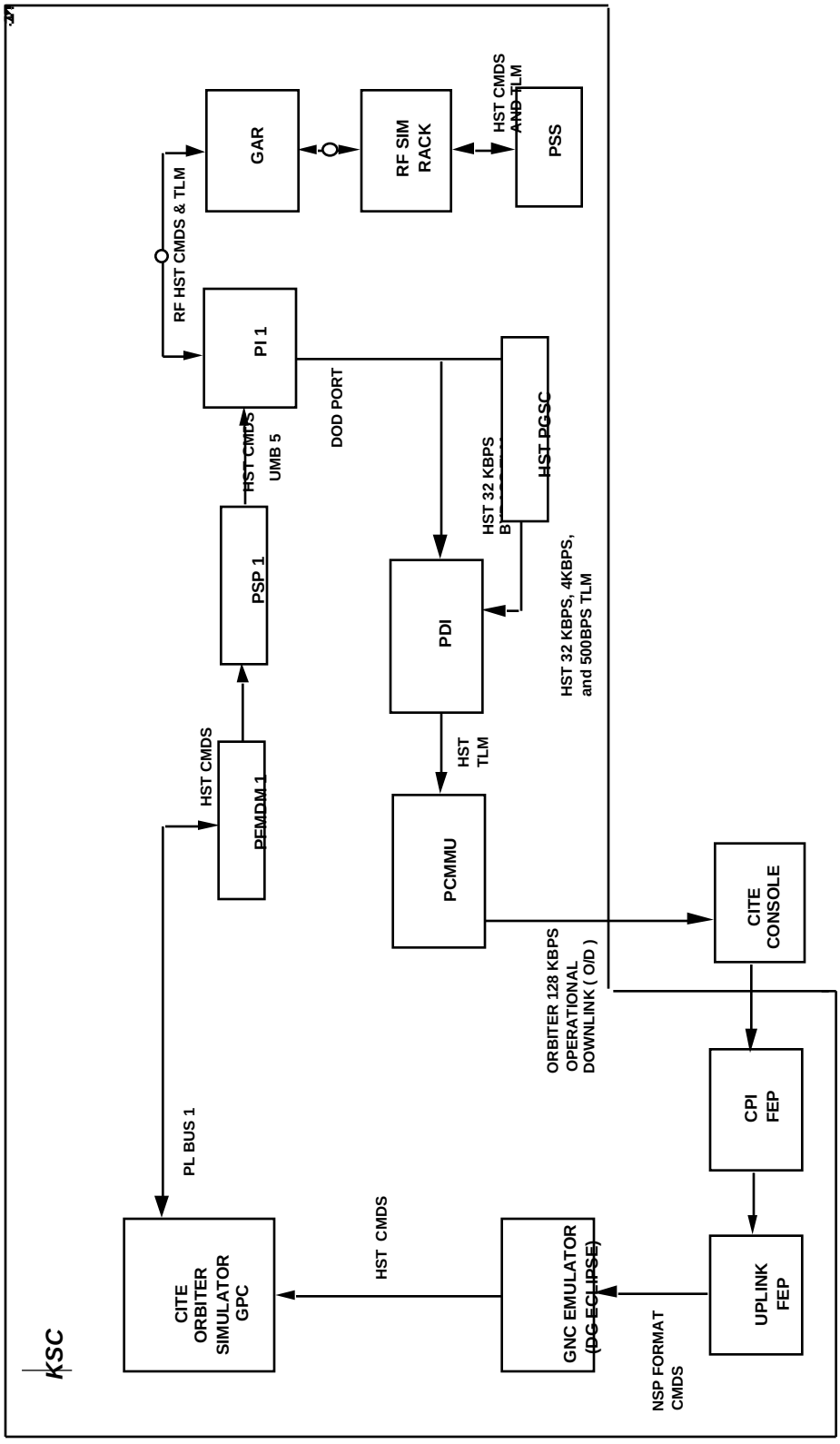

Figure D-2. PDT-2 Configuration

D.2.4.2 Code 441/510/515. Code 510/515 will provide personnel and procedures governing the PSS and RF Sim rack. Also, personnel to provide leadership and technical expertise for test activities involving HST specific items. Code 441 will provide system engineering support for data analysis involving the HST telemetry and commands.

D.2.4.3 Code 442. Code 442 will provide personnel and procedures involving the SSE and other HST flight hardware. Code 442 personnel to provide overall leadership for all test activities and technical expertise for test activities involving SSE specific items.

D.2.5 System/Facility Requirements

This Section identifies the Performance Demonstration Test - 2 (CITE Interface Verification Test) hardware and software. (See Table D-2)

Table D-2. **Facilities**

PDT-2 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
KSC	CITE	STS-82 SOFTWARE
NASA/GSFC/CODE 510/CODE	VPF	GSFC GSE
NASA/GSFC/CODE 442	VPF	SSE FLIGHT HARDWARE

D.2.5.1 Kennedy Space Center. KSC will provide an Orbiter simulator at the CITE facility to receive HST telemetry from the HST PSS via HST RF SIM rack to the CITE Payload Interrogator (PI). Also, to execute HST commands from the AFD to the HST PSS via the CITE PI and HST RF Sim rack.

D.2.5.2 Code 510/515. Code 510/515 will provide the HST PSS and HST RF Sim rack.

D.2.5.3 Code 442. Code 442 will provide the SSE hardware and the interconnections to the CITE facility.

D.2.6 Duration

Total test time including configuring and deconfiguring for the single test is 8 hours.

D.2.7 Dependencies

Dependencies for this test include:

- STS-82 flight software
- SIP connections for SSE
- GSFC GSE connection to CITE PI

D.2.8 Schedules

These are the planned dates for PDT-2 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 9/6/96

- Test Plan/Procedure (Final)..... 9/20/96

- Testing..... 12/16/96

- Test Report (Draft)..... 12/30/96
- Test Report (Final)..... 1/13/97

D.3 Performance Demonstration Test - 3 (MILA/GSFC GSE Checkout)

This Section provides detail information on the Performance Demonstration Test - 3 (MILA/GSFC GSE Checkout).

D.3.1 Purpose

PDT-3 is a string test which exercises the communications link between the GSFC GSE. PDT-3 will consist of three test sessions described below.

D.3.2 Objectives

This testing will checkout the interface between the various GSFC GSE supporting SM2 testing. The testing at MILA station will allow for flexibility in troubleshooting problems prior to entering KSC facilities and verifying the operations of the GSFC GSE prior to use in the ETE testing.

- Command:
  - Single and multiple command blocks
  - DF224 command loads
- Telemetry:
  - 500 bps S, 4 Kbps D/A, 32 Kbps T/H engineering data
  - 4 Kbps DF224 dump data

- 1MB Engineering Tape Recorder (ETR), Science Tape Recorder (STR), Real-Time (R/T) science, and NSSC-1 dump data

D.3.3 Activities

Test session 1 will verify the HST PSS functions planned to be used at KSC.

Test session 2 will verify the RF Sim rack functions planned to be used at KSC.

Test session 3 will verify the complete HST simulations capabilities.

Refer to Figure D-3 for an illustration of the PDT-2 test configuration.

D.3.4 Roles and Responsibilities

This Section identifies the Performance Demonstration Test -3 (MILA/GSFC GSE Checkout) support roles and responsibilities.

D.3.4.1 Merritt Island Launch Annex. MILA will provide personnel to schedule and assist in the evaluation of the PSS and RF Sim Racks readiness to support the KSC test activities. MILA personnel will be responsible for facility and personnel safety.

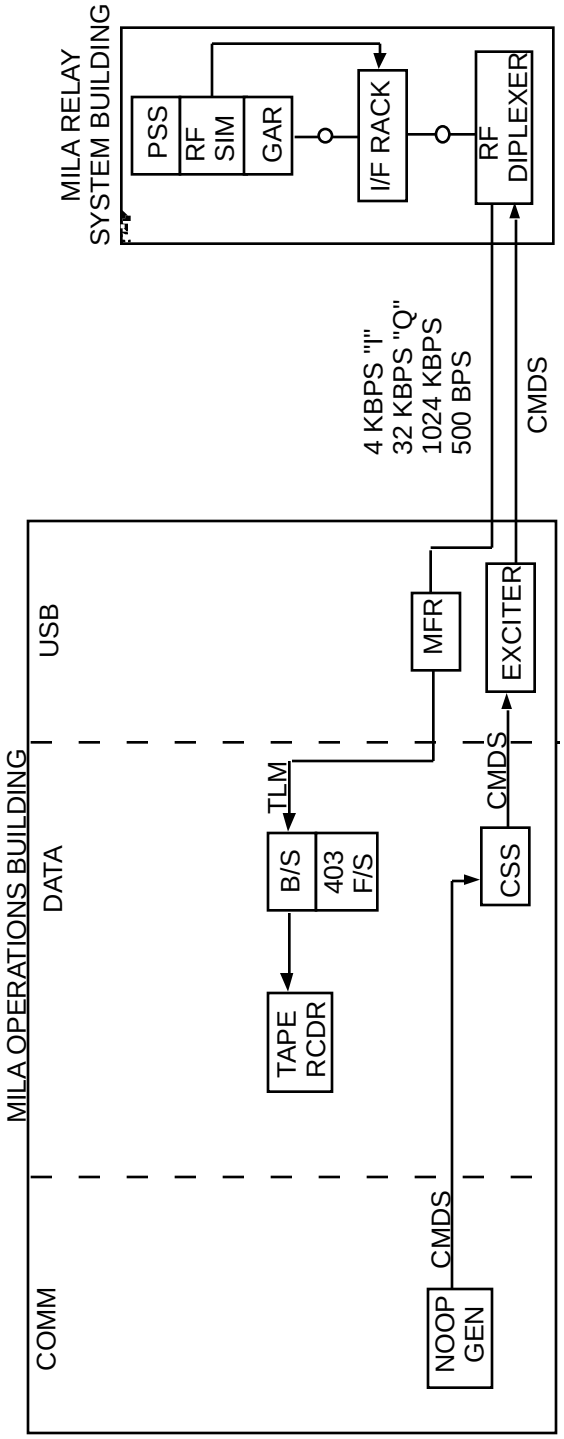

Figure D-3. PDT-3 Configuration

D.3.4.2 Code 510/515. Code 510/515 will provide personnel, procedures, and leadership and technical expertise for test activities involving HST specific items.

Table D-3. PDT-3 **Facilities**

PDT-3 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
MILA	MEB OPERATIONS BLDG.	NONE
Code 510/515	MEB	PSS/GAR/RF Sim GSE

D.3.5 System/Facility Requirements

This Section identifies the Performance Demonstration Test -3 (MILA/GSFC GSE Checkout) hardware and software. (See Table D-3).

D.3.5.1 Merritt Island Launch Annex. MILA will provide **a** facility for GSFC equipment, and data lines to receive HST telemetry from the HST PSS via HST RF Sim rack and to execute HST commands from MILA to the HST PSS HST RF Sim rack.

D.3.5.2 Code 510/515. Code 510/515 will provide the HST PSS and HST RF Sim rack **that will interface with the MILA facility.**

D.3.6 Duration

- Test Session 1 - 8 hours at MILA facility
- Test Session 2 - 8 hours at MILA facility
- Test Session 3 - 8 hours at MILA facility

D.3.7 Dependencies

Dependencies for this test include:

None

D.3.8 Schedules

These are the planned dates for PDT-3 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 9/6/96
- Test Plan/Procedure (Final)..... 9/20/96

- Testing..... 11/15/96

- Test Report (Draft)..... 11/22/96
- Test Report (Final)..... 12/5/96

D.4 Performance Demonstration Test-4 (OPF N10xx Testing)

This Section provides detail information on the Performance Demonstration Test-4 (OPF N10xx Testing).

D.4.1 Purpose

PDT-4 is a KSC activity that will verify the Orbiter interfaces. This test is under KSC direction and scheduling. All test objectives, procedures, and performance will be in accordance to KSC OMI N10xx

D.4.2 Objectives

This test will verify the Orbiter interfaces.

D.4.3 Activities

The test is incorporated into the OPF N10XX procedures which occurs locally at KSC. HST personnel will review the results of the KSC testing.

D.5 PERFORMANCE DEMONSTRATION TEST - 5 (PAD INTERFACE VERIFICATION TEST)

This Section provides detail**ed** information on the Performance Demonstration Test - 5 (Pad Interface Verification Test).

D.5.1 Purpose

PDT-5 is a string test which will verify the Orbiter to HST and SSE interfaces. PDT-5 will consist of a single six hour test session.

D.5.2 Objectives

The test will verify the Orbiter, HST (simulated by GSFC GSE), and SSE interfaces for STS-82 AFD command and telemetry.

- Command:
  - AFD command to SSE
  - AFD command to HST (Simulated by GSFC GSE)
- Telemetry:
  - Simulated HST 500 bps, 4 Kbps, and 32 Kbps
  - SSE T-0 connection

D.5.3 Activities

The test is incorporated into the Pad Interface Verification Test which occurs locally at KSC. The HST PSS and RF Sim rack will provide the interfaces for all HST commands and telemetry. The commands will be verified at the PSS and telemetry responses will be verified on the AFD. All test activities will be incorporated into the KSC OMI for this test.

Refer to Figure D-4 for an illustration of the PDT-5 test configuration.

D.5.4 Roles and Responsibilities

This Section identifies the Performance Demonstration Test - 5 (PAD Interface Verification Test) support roles and responsibilities.

D.5.4.1 Kennedy Space Center. KSC will provide personnel, plan/ procedures, and lead all activities during this test.

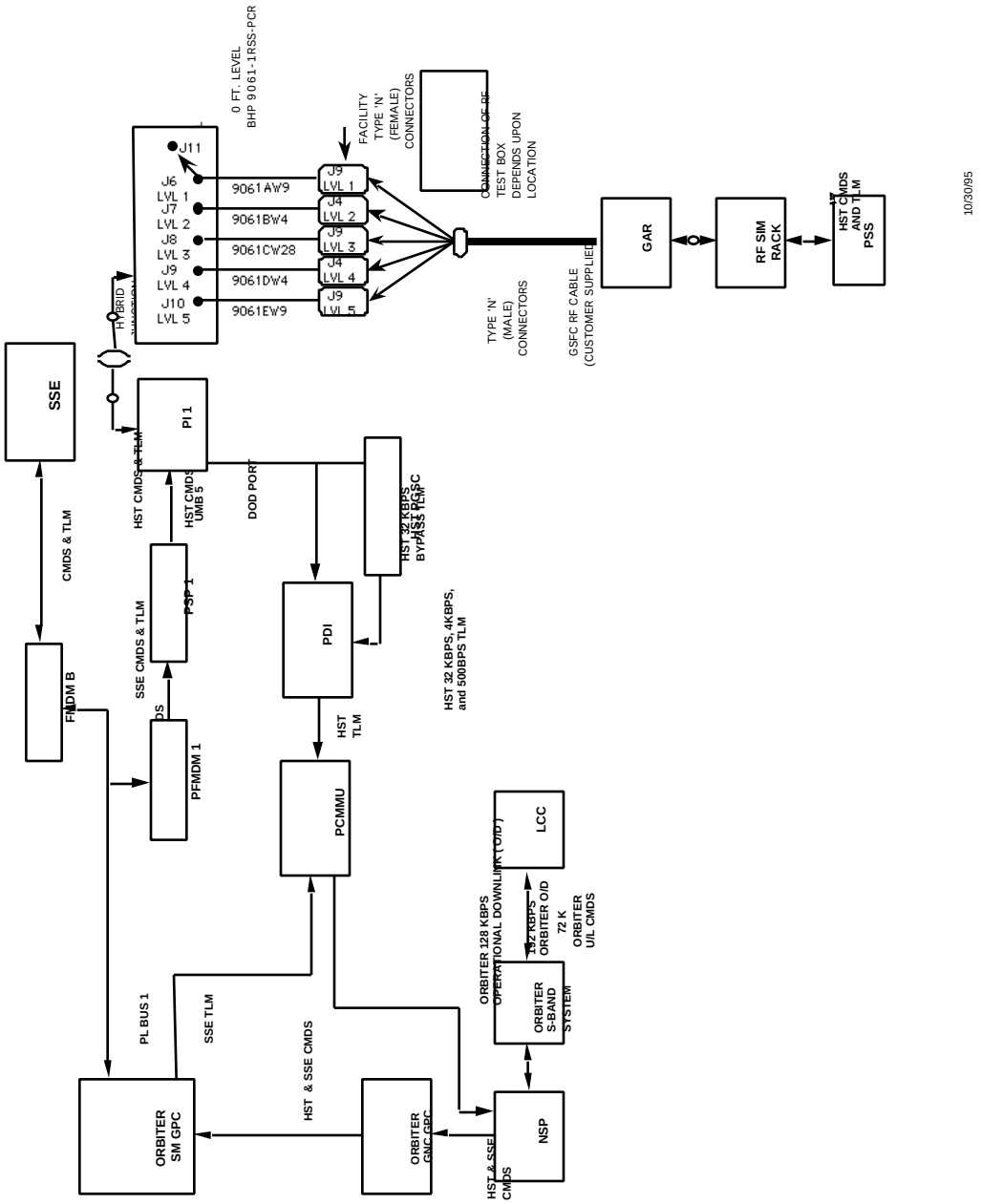

Figure D-4. PDT-5 Configuration

D.5.4.2 Code 441/510/515. Code 510/515 will provide personnel and procedures governing the PSS and RF Sim rack. Also, personnel to provide leadership and technical expertise for test activities involving HST specific items. Code 441 will provide system engineering support for data analysis involving the HST telemetry and commands.

D.5.4.3 Code 442. Code 442 will provide personnel and procedures involving the SSE and other HST flight hardware. Code 442 personnel to provide overall leadership for all test activities and technical expertise for test activities involving SSE specific items.

D.5.5 System/Facility Requirements

This Section identifies the Performance Demonstration Test - 5 (PAD Interface Verification Test) software and hardware. (See Table D-5).

Table D-5. **Facilities**

PDT-5 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
KSC	PAD	STS-82 SOFTWARE
NASA/GSFC/CODE 510/CODE 515	VPF	GSFC GSE
NASA/GSFC/CODE 442	VPF	SSE FLIGHT HARDWARE

D.5.5.1 Kennedy Space Center. KSC will provide an Orbiter at the Pad to receive HST telemetry from the HST PSS via HST RF Sim rack to the Orbiter PI. Also, to execute HST commands from the AFD to the HST PSS via the Orbiter PI and HST RF Sim rack.

D.5.5.2 Code 510/515. Code 510/515 will HST PSS and HST RF Sim rack.

D.5.5.3 Code 442. Code 442 will provide the SSE hardware **and interconnections to the Orbiter.**

D.5.6 Duration

Total test time including configuring and deconfiguring for the single test is 8 hours.

D.5.7 Dependencies

Dependencies for this test include:

- STS-82 flight software
- SIP connections for SSE
- GSFC GSE connection to PI

D.5.8 Schedules

These are the planned dates for PDT-5 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 9/6/96

- Test Plan/Procedure (Final)..... 9/20/96

- Testing..... 1/29/97

- Test Report (Draft)..... 2/7/97
- Test Report (Final)..... 2/14/97

D.6 INTERFACE PERFORMANCE ACTIVITY- 1 (JSC TELEMETRY TESTING)

This Section provides detail information on the Interface Performance Activity - 1 (JSC Telemetry Testing).

D.6.1 Purpose

IPA-1 is a string test which will verify the SPIF and STOCC telemetry processing software.

D.6.2 Objectives

The test will verify the flight software using the SPIF and STOCC. The HST will be simulated to provide a checkout of the flight telemetry processing at GSFC which will include:

- Simulated HST PDI and SSE simulated data telemetry to GSFC STOCC and SPIF

D.6.3 Activities

Test session 1 is exercised for an initial ground system software for telemetry processing.

Test session 2 is performed prior to the start of the JISs to verify readiness to support training.

Refer to Figure D-5 for an illustration of the IPA-1 test configuration.

D.6.4 Roles and Responsibilities

This section identifies the Interface Performance Activity - 1 (JSC Telemetry Testing) support roles and responsibilities.

D.6.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in any data analysis.

D.6.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment. Institutional Support. Institutional support for IPA-1 will include SPIF for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting NASCOM for data lines between facilities. The SOC will provide personnel to schedule and operate the equipment to reblock the HST simulator data.

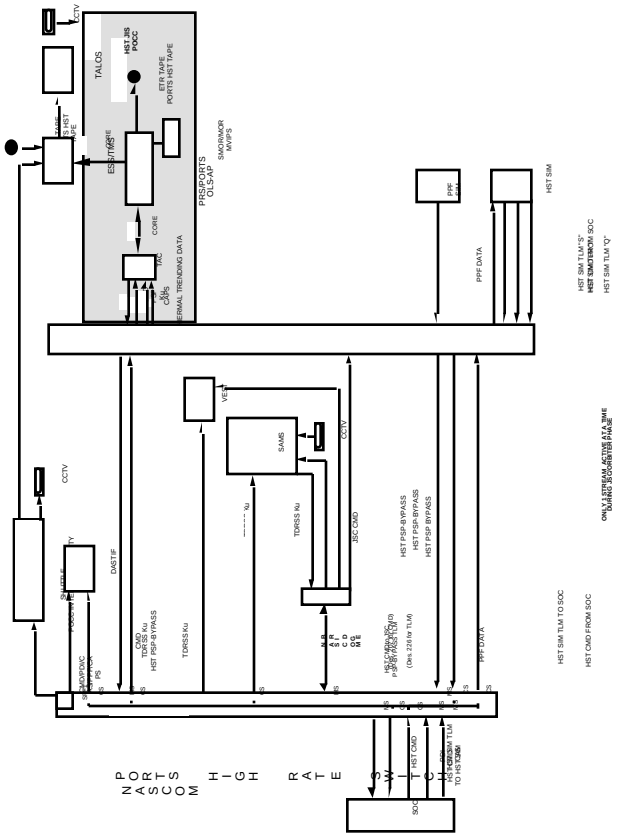

Figure D-5. IPA-1 Configuration

D.6.4.3 Institutional Support. Institutional support for IPA-1 will include SPIF for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting NASCOM for data lines between facilities. The SOC will provide personnel to schedule and operate the equipment to reblock the HST simulator data.

D.6.4.4 Code 441/510. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the operational scenarios for SM2. Code 510 will lead the test activities, prepare test procedures, coordinate personnel and equipment, and provide and analysis of the data.

D.6.5 System/Facility Requirements

This section identifies the Interface Performance Activity - 1 (JSC Telemetry Testing) hardware and software. (See Table D-6).

Table D-6. **Facilities**

IPA-1 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PRS	STOCC/MOR	PRS ON-LINE SYSTEM
INSTITUTIONAL SUPPORT	NASCOM/SPIF	SM2 MISSION SOFTWARE
NASA/GSFC/CODE 441	STOCC	PRS/PASSOPS

D.6.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the **Flight Operations Team (FOT). Consoles, voice loops and interfaces to NASCOM will be available for this test.**

D.6.5.2 **Space Telescope Operations Control Center/Data Operations Center**. The STOCC/DOC will the ground system **equipment**, interface with NASCOM the data lines, and **voice lines.**

D.6.5.3 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry.

D.6.5.4 Institutional Support. Institutional support for IPA-1 will include SPIF for telemetry processing and JSC interfacing, and NASCOM for data lines between facilities. The SOC will provide reblocking of HST simulator data.

D.6.6 Duration

Test Session 1 - 4 hours between JSC and GSFC facilities
Test Session 2 - 4 hours between JSC and GSFC facilities

D.6.7 Dependencies

Dependencies for this test include:

- SPIF and STOCC software for the SM2 (STS-82)

D.6.8 Schedules

These are the planned dates for IPA-1 activities, refer to the most recent version of the O&GS Project Schedule.

Early

- Test Plan/Procedure (Draft)..... 6/20/96
- Test Plan/Procedure (Final)..... 7/11/96

- Testing..... 7/25/96
- Test Report (Draft)..... 8/8/96
- Test Report (Final)..... 8/22/96

Late

- Test Plan/Procedure (Draft)..... 10/17/96
- Test Plan/Procedure (Final)..... 10/31/96

- Testing..... 11/14/96
- Test Report (Draft)..... 11/27/96
- Test Report (Final)..... 12/12/96

D.7 INTERFACE PERFORMANCE ACTIVITY - 2 (JSC HAZARDOUS COMMAND TESTING)

This Section provides detail information on the Interface Performance Activity - 2 (JSC Hazardous Command Testing).

D.7.1 Purpose

IPA-2 is a string test which will verify the JSC MCC and STOCC hazardous command checking software. This test will occur twice, once for initial ground system checks and then again prior to the start of the JISs.

D.7.2 Objectives

The test will verify the flight software using the JSC-MCC-H, SPIF, and STOCC. The HST will be simulated to provide a checkout of the following flight command processing and telemetry:

- Commands:
  - CDI A and B
  - 1 and 2 step

- Individual hazardous command groups enabling and disabling

- Telemetry:
  - Simulated HST PDI telemetry to GSFC STOCC for command verification

D.7.3 Activities

This test session will verify all HST hazardous commands and commands with similar bit patterns are processed by the JSC PHE and GSFC PRS systems correctly.

Refer to Figure D-6 for an illustration of the IPA-2 test configuration.

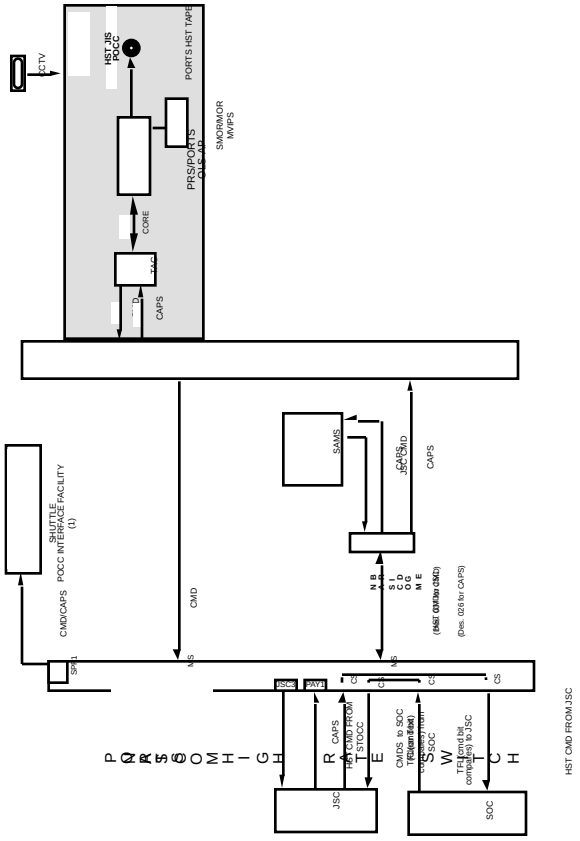

Figure D-6. IPA-2 Configuration

D.7.4 Roles and Responsibilities

This Section identifies the Interface Performance Activity - 2 (JSC Hazardous Command Testing) roles and responsibilities.

D.7.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in data analysis.

D.7.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

D.7.4.3 Johnson Space Center. JSC support for IPA-2 will include providing personnel to assist in procedure development and execution, schedule and man the consoles at JSC, assure the STS-82 software is available. JSC personnel are responsible for all JSC test activities.

D.7.4.4 Institutional Support. Institutional support for IPA-1 will include SPIF for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting NASCOM for data lines between facilities. The SOC will provide personnel to schedule and operate the equipment, used to reblock the HST simulator data.

D.7.4.5 Code 441/510. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the operational scenarios for SM2. Code 510 will lead the

test activities, prepare test procedures, coordinate personnel and equipment, and analysis of the data.

D.7.5 System/Facility Requirements

This Section identifies the Interface Performance Activity - 2 (JSC Hazardous Command Testing) hardware and software. (See Table D-7).

Table D-7. IPA-2 **Facilities**

IPA-2 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PRS	STOCC/MOR	PRS ON-LINE SYSTEM
JSC	MCC-H	STS-82 PHE SYSTEM
INSTITUTIONAL SUPPORT	NASCOM/SPIF	SM2 MISSION SOFTWARE
NASA/GSFC/CODE 441	STOCC	PRS/PASSOPS

D.7.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the FOT. Consoles, voice loops and interfaces to NASCOM will be available for this test.

D.7.5.2 **Space Telescope Operations Control Center/Data Operations Center**. The STOCC/DOC will provide the ground system, interface with NASCOM to configure the data lines, and **voice lines.** The STOCC/DOC will be responsible for all HST ground system equipment.

D.7.5.3 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support command generation and telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry and the transmission of commands to JSC.

D.7.5.4 Johnson Space Center. JSC support for IPA-2 will include providing hazardous command checking at the MCC-H and responds to hazardous command checking via NASCOM.

D.7.5.5 Institutional Support. Institutional support for IPA-2 will include SPIF for telemetry processing, command logging, and JSC interfacing. NASCOM will provide data lines between facilities. The SOC will provide reblocking **equipment for** HST simulator data.

D.7.6 Duration

Test Session 1 - 4 hours between JSC and GSFC facilities
Test Session 2 - 4 hours between JSC and GSFC facilities

D.7.7 Dependencies

Dependencies for this test include:

- SPIF, MCC-H, and STOCC software for the SM2 (STS-82)

D.7.8 Schedules

These are the planned dates for IPA-2 activities, refer to the most recent version of the O&GS Project Schedule.

Early

- Test Plan/Procedure (Draft)..... 6/20/96
- Test Plan/Procedure (Final)..... 7/11/96

- Testing..... 7/25/96
- Test Report (Draft)..... 8/8/96
- Test Report (Final)..... 8/22/96

Late

- Test Plan/Procedure (Draft)..... 10/17/96
- Test Plan/Procedure (Final)..... 10/31/96

- Testing..... 11/14/96
- Test Report (Draft)..... 11/27/96
- Test Report (Final)..... 12/12/96

D.8 INTERFACE PERFORMANCE ACTIVITY - 3 (INTEGRATED LOAD CHECKOUT)

This Section provides detail information on the Interface Performance Activity - 3 (Integrated Load Checkout).

D.8.1 Purpose

IPA-3 is a string test which will verify the JIS configuration prior to the start of the JISs.

D.8.2 Objectives

The test will verify the software and systems that will be used during the JISs.

- Command:
  - 1 and 2 Step
  - 1 and 2 Stage

- Telemetry:
  - Simulated HST PDI simulated data telemetry to GSFC STOCC and SPIF
  - Simulated SSE simulated data telemetry to GSFC STOCC and SPIF

D.8.3 Activities

The single test session will occur between GSFC and JSC facilities. The test session will exercise the configuration and procedures that will be used in the HST SM2 JISs.

Refer to Figure D-7 for an illustration of the IPA-3 test configuration.

D.8.4 Roles and Responsibilities

This Section identifies the Interface Performance Activity - 3 (Integrated Load Checkout) roles and responsibilities.

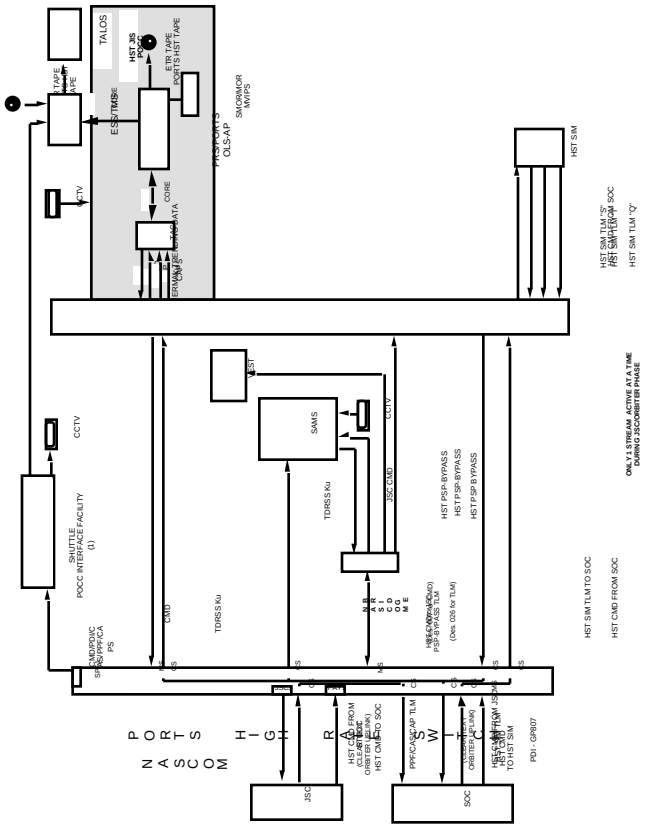

Figure D-7. IPA-3 Configuration

D.8.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in any data analysis in the ESS and PASS areas as well.

D.8.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

D.8.4.3 Johnson Space Center. JSC support for IPA-3 will include providing personnel, procedures, scheduling and manning the consoles at JSC, assure the STS-82 software is available and is responsible for all test activities.

D.8.4.4 Institutional Support. Institutional support for IPA-1 will include SPIF for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting NASCOM for data lines between facilities. The SOC will provide personnel to schedule and operate the equipment to reblock the HST simulator data.

D.8.4.5 Code 441/510. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the operational scenarios for SM2. Code 510 will assist in preparing test procedures, coordinating personnel and equipment, and analysis of the data.

D.8.5 System/Facility Requirements

This Section identifies the Interface Performance Activity - 3 (Integrated Load Checkout) hardware and software. (See Table D-8).

Table D-8. IPA-3 **Facilities**

IPA-3 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PRS	STOCC/MOR	PRS ON-LINE SYSTEM
JSC	MCC-H	STS-82 PHE SYSTEM
INSTITUTIONAL SUPPORT	NASCOM/SPIF	SM2 MISSION SOFTWARE
NASA/GSFC/CODE 441	STOCC	PRS/PASSOPS

D.8.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the FOT. Consoles, voice loops and interfaces to NASCOM will be available for this test. Equipment, data lines, and consoles for data analysis will be provided in the ESS and PASS areas.

D.8.5.2 **Space Telescope Operations Control Center/Data Operations Center**. The STOCC/DOC will provide the ground system **equipment**, interface with NASCOM data lines, **and voice lines.** The STOCC/DOC will be responsible for all HST ground system equipment.

D.8.5.3 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support command generation and telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry and the transmission of commands to JSC. PRS will also interface with ESS, STScI, and PASS for nominal engineering data flows and data analysis as defined in the test procedure.

D.8.5.4 Johnson Space Center. JSC support for IPA-**3** will include providing hazardous command checking at the MCC-H, **and responds to hazardous command checking via NASCOM, and an** SSE simulator **transmitting data to GSFC.**

D.8.5.5 Institutional Support. Institutional support for IPA-**3** will include SPIF for telemetry processing, command logging, and JSC interfacing. NASCOM will provide data lines between facilities. The SOC will provide reblocking of HST simulator data.

D.8.6 Duration

Test Session - 6 hours between JSC and GSFC facilities

D.8.7 Dependencies

Dependencies for this test include:

- SPIF, MCC-H, and STOCC software for the SM2 (STS-82)

D.8.8 Schedules

These are the planned dates for IPA-3 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 10/1/96
- Test Plan/Procedure (Final)..... 10/8/96

- Testing..... 10/15/96

- Test Report (Draft)..... 10/29/96
- Test Report (Final)..... 11/10/96

D.9 Interface Performance Activity-4 (external facility support)

This Section provides detail information on the Interface Performance Activity - 4 (External Facility Support).

D.9.1 Purpose

IPA-4 is a string test which will verify the GSFC provided equipment installed at JSC to support the SM2 activities.

D.9.2 Objectives

The test will verify the software and systems located at JSC, that GSFC will provide to support the SM2 mission.

- MVIPs.
- Printers.
- Mission Information Systems.
- SM/PART.
- Mail servers and
- Internet connections.

D.9.3 Activities

Test sessions will occur at between JSC and GSFC facilities. The structure of the testing will verify each component individually and as a total system.

Refer to Figure D-8 for an illustration of the IPA-4 test configuration.

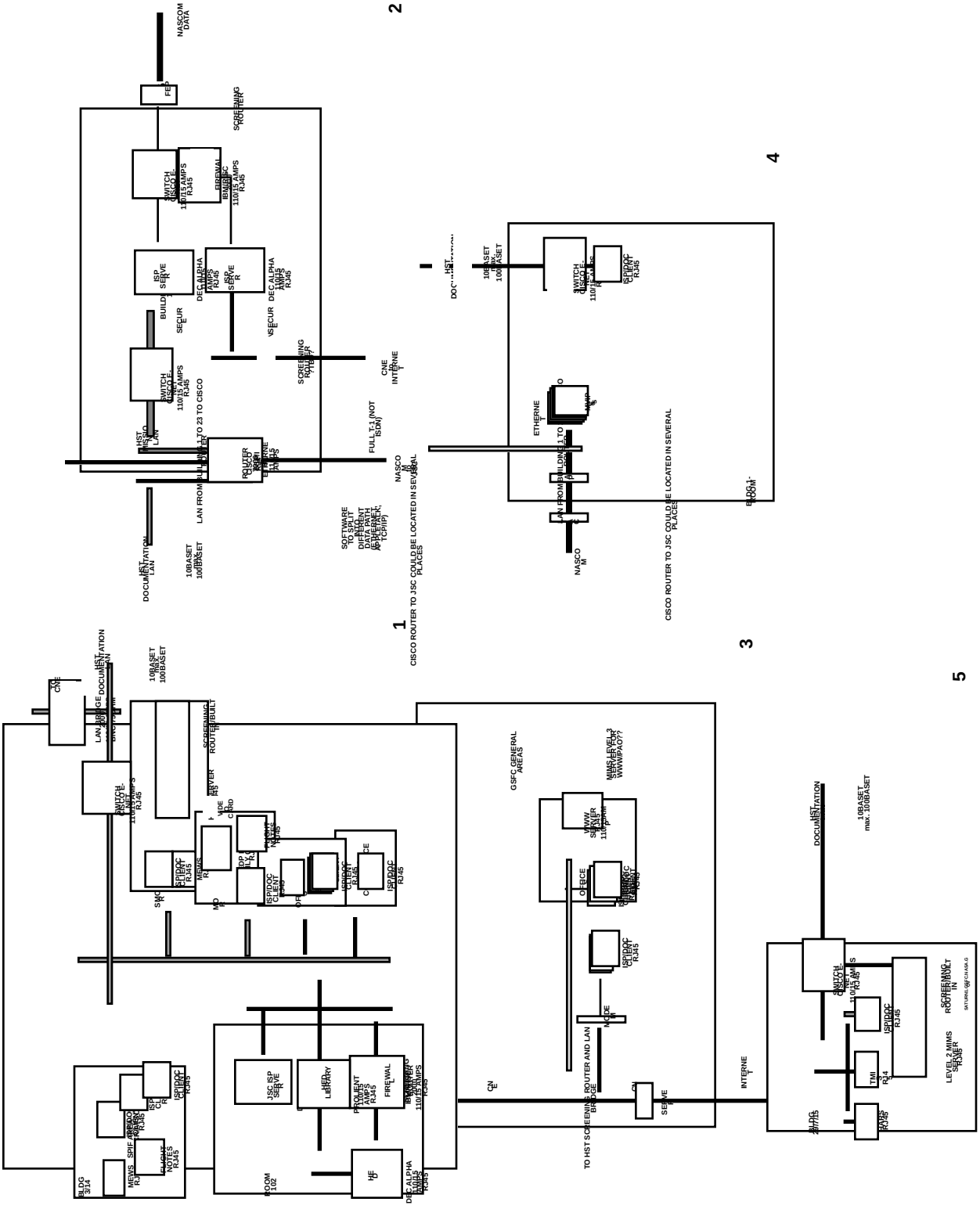

Figure D-8. IPA-4 Configuration **One**

TBR

Figure D-8. IPA-4 Configuration **Two**

D.9.4 Roles and Responsibilities

This Section identifies the Interface Performance Activity - 4 (External Facility Support) roles and responsibilities.

D.9.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing.

D.9.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

D.9.4.3 Johnson Space Center. JSC support for IPA-4 will include providing personnel to transfer files, provide data analysis, and responsible for test at JSC activities.

D.9.4.4 Institutional Support. Institutional support for IPA-4 will include NASCOM personnel for configuring the data lines and assisting in troubleshooting.

D.9.4.5 Code 441/510. Code 441 will provide personnel to assist in data analysis and data transfers. Code 510 will assist in preparing test procedures, coordinating personnel and equipment, and analysis of the data.

D.9.5 System/Facility Requirements

This Section identifies the Interface Performance Activity - 4 (External Facility Support) hardware and software. (See Table D-9).

Table D-9. IPA-4 **Facilities**

IPA-4 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PRS	STOCC/MOR	PRS ON-LINE SYSTEM
JSC	MCC-H/POCCs/CSR	NONE
INSTITUTIONAL SUPPORT	NASCOM	DATA LINES

D.9.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the FOT. The FOT will assure that on-going operations are not interrupted by the testing.

D.9.5.2 **Space Telescope Operations Control Center/Data Operations Center** The STOCC/DOC will provide the ground system **equipment**, interface with NASCOM data lines **and voice lines**. The STOCC/DOC will be responsible for all HST ground system equipment.

D.9.5.3 GSFC Systems. The GSFC systems include electronic libraries, telemetry distribution systems, electronic informational systems and e-mail systems. These will be connected to JSC and transfers between the various systems will be verified.

D.9.5.4 Johnson Space Center. JSC support for IPA-4 will include providing installation of data lines and LANs at JSC POCC.

D.9.5.5 Institutional Support. Institutional support for IPA-4 will **provide HST dedicated T-1 lines between facilities.**

D.9.6 Duration

Test Sessions - 40 hours at the JSC facility

D.9.7 Dependencies

Dependencies for this test include:

- HST SAMS facility readiness for SM2
- JSC installed LANs completed
- NASCOM T-1 line installed and routers operational

D.9.8 Schedules

These are the planned dates for IPA-4 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 10/7/96
- Test Plan/Procedure (Final)..... 10/18/96

- Testing..... 10/21/96

- Test Report (Draft)..... 11/15/96
- Test Report (Final)..... 11/29/96

D.10 INTERFACE PERFORMANCE ACTIVITY- 5 (ELECTRONIC SHUTTLE TEST LAB (ESTL)/SHUTTLE AVIONICS INTERFACE LAB (SAIL) TESTING)

This Section provides detail information on the Interface Performance Activity- 5 (Electronic Shuttle Test Lab (ESTL)/Shuttle Avionics Interface Lab (SAIL) Testing).

D.10.1 Purpose

IPA-5 is a string test which will verify the GSFC provided equipment installed at JSC to support the SM2 activities.

D.10.2 Objectives

The test will verify the PSS and RF Sim rack software and systems are integrated into the JSC ESTL/SAIL facility prior to exercising the End-to-End testing. This equipment also will provide a data source for checkout for the Payload and General Support Computer (PGSC) and AFD displays and commands.

D.10.3 Activities

This test will provide interface and software verification of the HST PGSC system with Orbiter avionics in an environment which allows for troubleshooting and detailed testing and analysis.

Refer to Figure D-9 for an illustration of the IPA-5 test configuration.

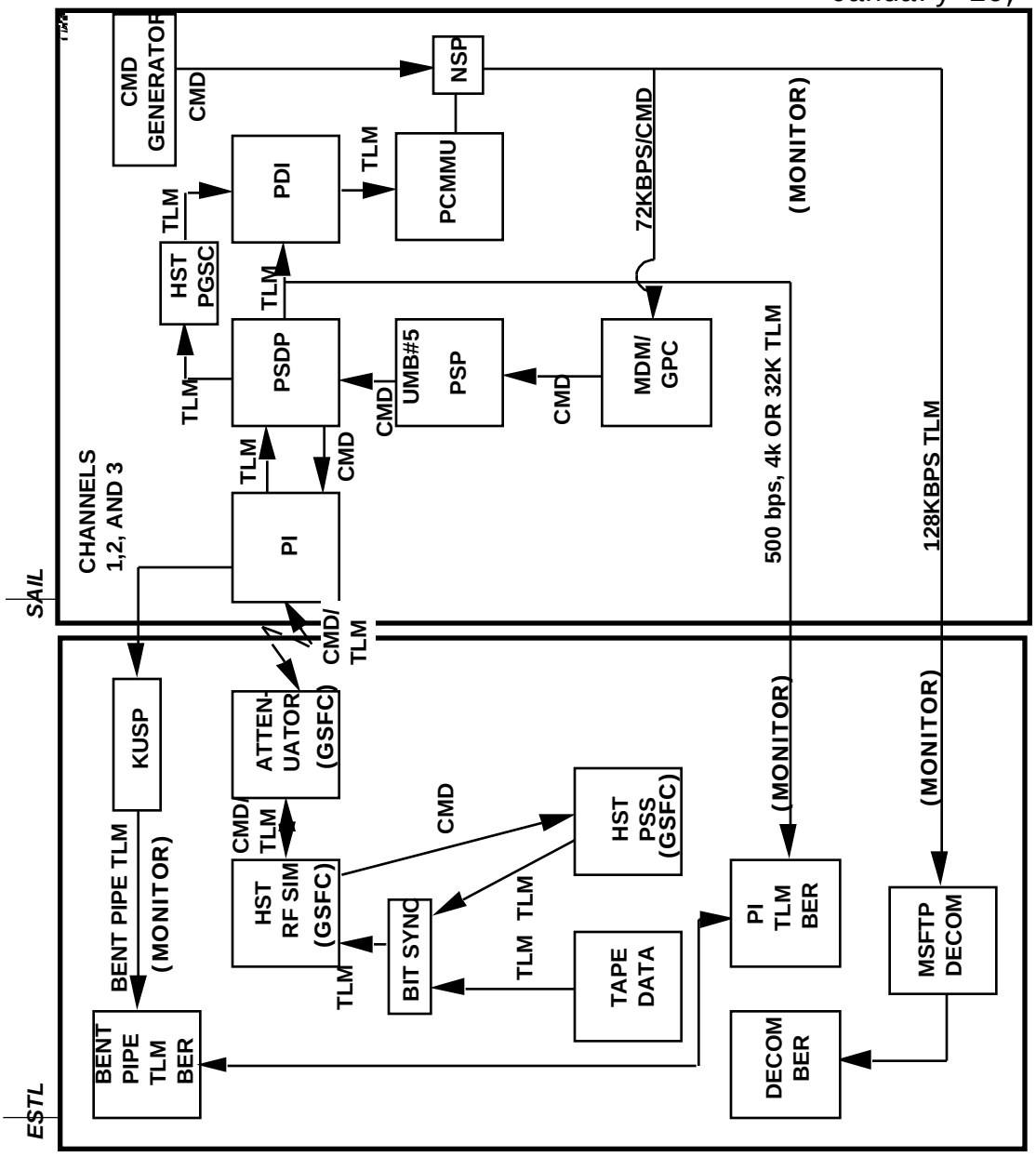

Figure D-9. IPA-5 Configuration

D.10.4 Roles and Responsibilities

The Section identifies the Interface Performance Activity - 5 (Electronic Shuttle Test Lab (ESTL)/Shuttle Avionics Interface Lab (SAIL) Testing) roles and responsibilities.

D.10.4.1 Johnson Space Center. JSC support for IPA-5 will include providing personnel to schedule, operate, prepare

test procedures, and data analysis at the ESTL and SAIL facilities. JSC personnel will be responsible for all test activities involving JSC facilities.

D.10.4.2 Code 441/510/515. Code 441 will provide personnel to assist in data analysis. Code 510 will assist in preparing test procedures, coordinating personnel and equipment, and analysis of the data. Code 510 will lead the test activities. Code 515 will provide personnel to operate the PSS and RF Sim Rack, following the Test Conductor directions, and reviewing procedures.

D.10.5 System/Facility Requirements

The Section identifies the Interface Performance Activity - 5 (Electronic Shuttle Test Lab (ESTL)/Shuttle Avionics Interface Lab (SAIL) Testing) hardware and software. (See Table D-10).

Table D-10. IPA-5 **Facilities**

IPA-5 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
JSC	ESTL/SAIL	HST SOFTWARE
INSTITUTIONAL SUPPORT	NASCOM/SOC	PSS, RF Sim rack

D.10.5.1 Johnson Space Center. JSC support for IPA-5 will include providing telemetry processing by the MCC-H, interfaces to a PI, a PGSC, expansion chassis, and STS-82 software. JSC will provide Orbiter test equipment in the SAIL and ESTL facilities.

D.10.5.2 Institutional Support. Institutional support **for IPA-4 will include** the SOC providing a PSS and RF Sim rack.

D.10.6 Duration

Test Session - 60 hours at JSC

D.10.7 Dependencies

Dependencies for this test include:

- JSC and STOCC software for the SM2 (STS-82)
- PGSC interfaces

D.10.8 Schedules

These are the planned dates for IPA-5 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 12/15/95
- Test Plan/Procedure (Final)..... 1/26/96

- Test Window..... 2/4/96

- Test Report (Draft)..... 4/15/96
- Test Report (Final)..... 4/29/96

D.11 End-To-End Test-1 (Cargo Integration Test Equipment)

This Section provides detail information on the End-To-End Test-1 (Cargo Integration Test Equipment).

D.11.1 Purpose

ETE-1 is an end-to-end test which will verify HST (simulated) and SSE data links between the CITE avionics, JSC MCC-H, GSFC SPIF, and STOCC.

D.11.2 Objectives

Simulated HST telemetry will be used to verify HST unique Payload Signal Processor (PSP)-bypass and PGSC cabling. ETE-1 will verify payload and PPF data processing at GSFC.

- Command:
  - SSE commands (Both AFD and backup MCC-H).
  - HST JSC commanding 1-stage and 2-stage.
  - Single and multiple command blocks.

- Telemetry:
  - SSE data to GSFC SPIF.
  - 500 bps S, 4 Kbps D/A, 32 Kbps T/H engineering data.
  - 4 Kbps DF224 dump data.

D.11.3 Activities

This test will verify the end-to-end interfaces and systems supporting the SM2. This test will use TDRSS and the Space Network (SN), as well as the flight systems at GSFC and JSC. This test will be repeated at the pad with the Orbiter.

Refer to Figure D-10 for an illustration of the ETE-1 test configuration.

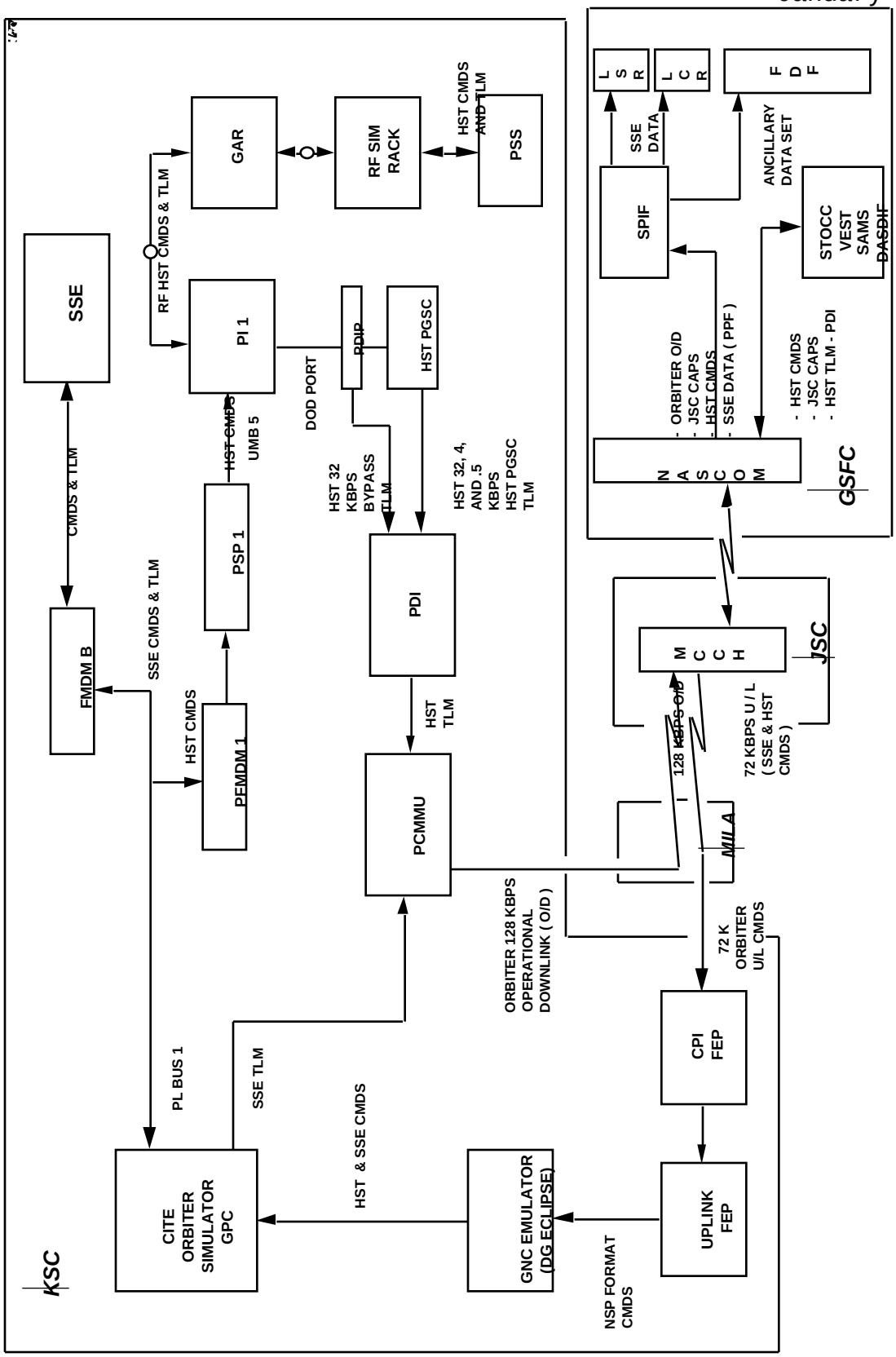

Figure D-10. ETE-1 Configuration

D.11.4 Roles and Responsibilities

This Section identifies the End-To-End Test-1 (Cargo Integration Test Equipment) roles and responsibilities.

D.11.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in any data analysis in the ESS and PASS areas as well.

D.11.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

D.11.4.3 Johnson Space Center. JSC support for ETE-1 will include providing personnel, procedures, scheduling and manning the consoles at JSC, assure the STS-82 software is available and is responsible for JSC test activities.

D.11.4.4 Kennedy Space Center. KSC support for ETE-1 will include providing personnel, procedures, scheduling and manning the consoles at KSC, and is responsible for all test activities.

D.11.4.5 Institutional Support. Institutional support for ETE-1 will include SPIF for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting NASCOM for data lines between facilities.

D.11.4.6 Code 441/442/510/515. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the HST operational scenarios for SM2. Code 442 will provide personnel to assist in preparing the SSE test procedures, coordinating SSE personnel and equipment, and analysis of the SSE data. Code 442 will also provide personnel to provide overall leadership for all test activities and technical expertise for test activities involving SSE specific items. Code 510 will assist in preparing HST test procedures, coordinating HST personnel and equipment, and analysis of the HST data. Also, personnel to provide leadership and technical expertise for test activities involving HST specific items. Code 515 will provide personnel to operate the PSS and RF Sim Rack, following the test conductors directions.

D.11.4.7 Packet Processor II. Personnel will assure the engineering data collected in parallel does not interfering with on-going operations and will provide data analysis.

D.11.5 System/Facility Requirements

This Section identifies the End-To-End Test-1 (Cargo Integration Test Equipment) hardware and software. (See Table D-11).

Table D-11. **Facilities**

ETE-1 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PACOR II	BLDG. 23	TEST SYSTEM PACKET PROCESSOR
PRS	VEST/SAMS/STOCC/MOR	PRS ON-LINE SYSTEM
JSC	MCC/CSR1&2/POCC1&2	MCC MISSION SOFTWARE
KSC	CITE/VPF	SM2 MISSION SOFTWARE
INSTITUTIONAL SUPPORT	FDF/SPIF/DCF/LSR/ NASCOM	SM2 MISSION SOFTWARE
MILA	MIL/SHUTTLE SYSTEMS	SM2 SUPPORT SOFTWARE
NASA/GSFC/CODE 441/442	STOCC/VEST	PRS/PASSOPS/VEST

D.11.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the FOT. Consoles, voice loops and interfaces to NASCOM will be available for this test. Equipment, data lines, and consoles for data analysis will be provided in the ESS and PASS areas.

D.11.5.2 **Space Telescope Operations Control Center/Data Operations Center**. The STOCC/DOC will provide the ground system **equipment**, interface with NASCOM data lines **and voice lines**. The STOCC/DOC will be responsible for all HST ground system equipment.

D.11.5.3 Packet Processor II. PACOR II system located in building 23 will monitor and collect the engineering data in parallel **without** interfering with on-going operations. If the

engineering data is need**ed** for data analysis PACOR II will be notified by the test conductor. PACOR II will also provide block level data quality monitoring in real-time.

D.11.5.4 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support **command generation and** telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry, **and the transmission of commands to JSC. PRS will also interface with** ESS, STScI, and PASS for ESS, STScI, and PASS for **nominal engineering data flows and data analysis as defined in the test procedure.**

D.11.5.5 Johnson Space Center. JSC support will include providing hazardous command checking at the MCC-H, telemetry processing, SSE command generation, and **communicate with GSFC as expected during SM2.**

D.11.5.6 Kennedy Space Center. KSC will provide an Orbiter simulator at the CITE to receive HST telemetry from the HST PSS via HST RF Sim rack to the CITE PI. Also, to execute HST commands from the AFD to the HST PSS via the CITE PI and HST RF Sim rack. SSE telemetry, interfaces, and commands will be executed with the SSE flight hardware and KSC CITE facility.

D.11.5.7 Institutional Support. Institutional support will include SPIF for telemetry processing and JSC interfacing, and NASCOM for data lines between facilities. The SOC will provide a PSS and RF Sim rack at KSC. Code 510/515 will provide the HST PSS and HST RF Sim rack.

D.11.5.8 Merritt Island Launch Annex. MILA will provide equipment to support a direct TDRSS interface from KSC to the SN.

D.11.6 Duration

ETE-1 will consist of a single 6 hour test session.

D.11.7 Dependencies

Dependencies for this test include:

- IPA-1 JSC telemetry test
- IPA-2 JSC hazardous command check test
- PDT-1 AFT Deck TLM/CMD test
- PDT-2 CITE interface test
- PDT-3 MILA/GSFC GSE testing
- SMGT-22 ground system (SR#3) test

D.11.8 Schedules

These are the planned dates for ETE-1 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 9/6/96
- Test Plan/Procedure (Final)..... 9/20/96

- Testing..... 12/17/96

- Test Report (Draft)..... 12/30/96
- Test Report (Final)..... 1/13/97

D.12 End-To-End Test-2 (Pad Testing)

This Section provides detail information on the End-to-End Test-2 (Pad Testing)

D.12.1 Purpose

ETE-2 is an end-to-end test which will be the final verification of the HST (simulated) and SSE data links prior to the second servicing mission.

D.12.2 Objectives

The end-to-end test will verify the flight configuration using the Orbiter, JSC-MCC-H, SSE, SPIF, and STOCC. The HST will be simulated to provide a checkout of the flight PSP-bypass and PGSC-II cabling. This testing will verify payload and PPF data processing at GSFC.

- Command:
  - SSE commands
  - HST commands

- Telemetry:
  - SSE data to GSFC SPIF and other on site (GSFC) locations
  - 500 bps S, 4 Kbps D/A, 32 Kbps T/H engineering data
  - 4 Kbps DF224 dump data

D.12.3 Activities

This test session will be a repeat of the activities and procedures exercised in the KSC CITE facility. This will be the final check of the entire string of systems involved in the SM2.

Refer to Figure D-11 for an illustration of the ETE-2 test configuration.

D.12.4 Roles and Responsibilities

This Section identifies the End-To-End Test - 2 (PAD Testing), roles and responsibilities.

D.12.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in any data analysis in the ESS and PASS areas as well.

D.12.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

D.12.4.3 Johnson Space Center. JSC support for ETE-1 will include providing personnel, procedures, scheduling and manning the consoles at JSC, assure the STS-82 software is available and is responsible for JSC test activities.

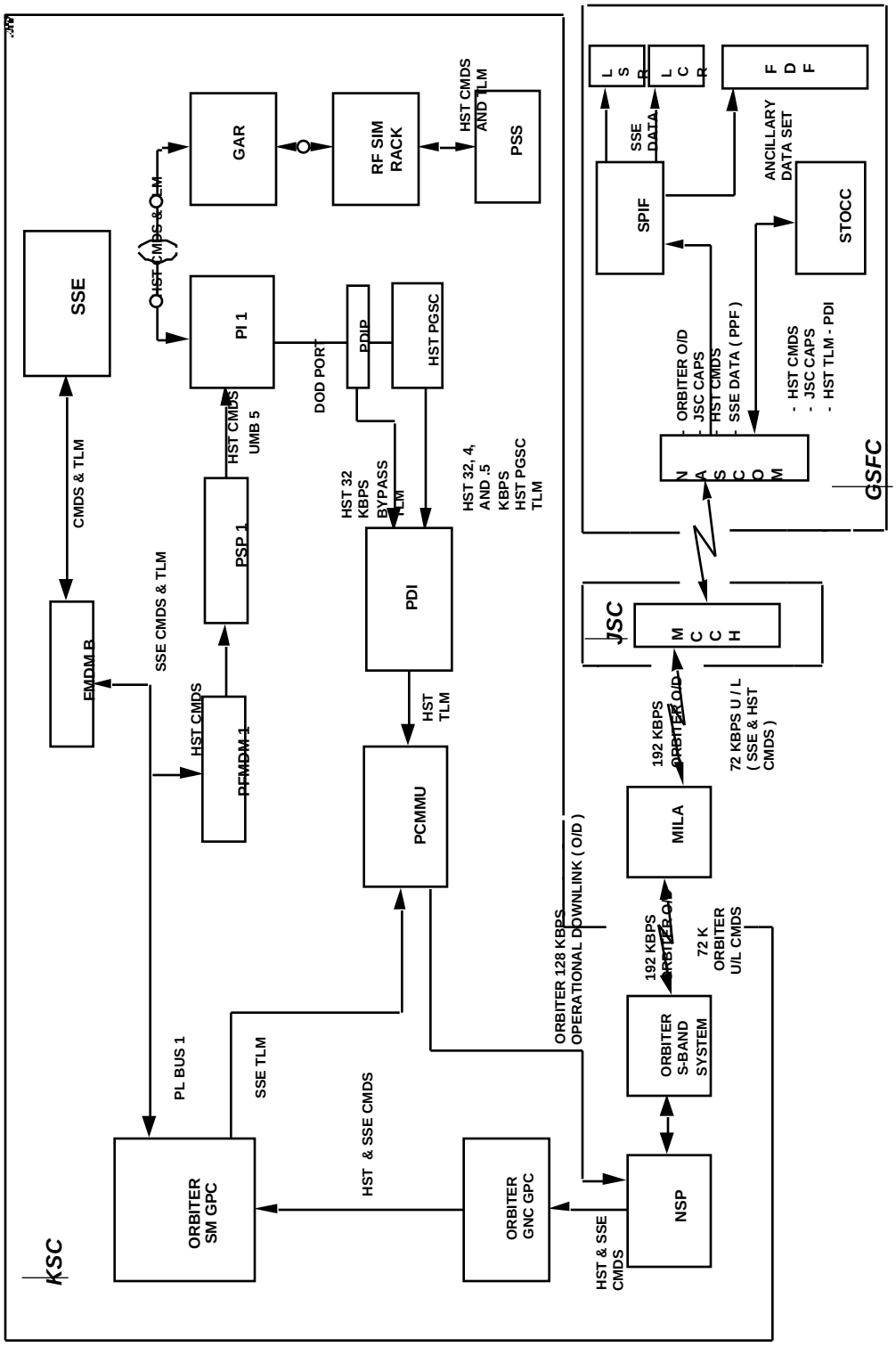

Figure D-11. ETE-2 Configuration

D.12.4.4 Kennedy Space Center. KSC support for ETE-1 will include providing personnel, procedures, scheduling and manning the consoles at KSC, and is responsible for all test activities.

D.12.4.5 Institutional Support. Institutional support for ETE-1 will include SPIF for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting NASCOM for data lines between facilities.

D.12.4.6 Code 441/442/510/515. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the HST operational scenarios for SM2. Code 442 will provide personnel to assist in preparing the SSE test procedures, coordinating SSE personnel and equipment, and analysis of the SSE data. Code 442 personnel to provide overall leadership for all test activities and technical expertise for test activities involving SSE specific items. Code 510 will assist in preparing HST test procedures, coordinating HST personnel and equipment, and analysis of the HST data. Also, personnel to provide leadership and technical expertise for test activities involving HST specific items. Code 515 will provide personnel to operate the PSS and RF Sim Rack, following the test conductors directions.

D.12.4.7 Packet Processor II. Personnel will assure the engineering data collected in parallel does not interfering with on-going operations and will provide data analysis.

D.12.5 System/Facility Requirements

This Section identifies the End-To-End Test - 2 (PAD Testing), hardware and software. (See Table D-12).

D.12.6 Table D-12. **Facilities**

ETE-2 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PACOR II	BLDG. 23	TEST SYSTEM PACKET PROCESSOR
PRS	VEST/SAMS/STOCC/MOR	PRS ON-LINE SYSTEM
JSC	MCC/CSR1&2/POCC1&2	MCC MISSION SOFTWARE
KSC	LCC/PAD A	SM2 MISSION SOFTWARE
INSTITUTIONAL SUPPORT	FDF/SPIF/DCF/LSR/ NASCOM	SM2 MISSION SOFTWARE
MILA	MIL/SHUTTLE SYSTEMS	SM2 SUPPORT SOFTWARE
NASA/GSFC/CODE 441/442	STOCC/VEST	PRS/PASSOPS/VEST

D.12.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the FOT. **Consoles, voice loops and interfaces to NASCOM will be available for this test. Equipment, data lines, and consoles for data analysis will be provided in the ESS and PASS areas.**

D.12.5.2 **Space Telescope Operations Control Center/Data Operations Center**. The STOCC/DOC will provide the ground system **equipment**, interface with NASCOM data lines **and voice lines**. The STOCC/DOC will be responsible for all HST ground system equipment.

D.12.5.3 Packet Processor II. The PACOR II system located in building 23 will monitor and collect the engineering data in

parallel **without** interfering with on-going operations. If the engineering data is need**ed** for data analysis PACOR II will be notified by the test conductor. PACOR II will also provide block level data quality monitoring in real-time.

D.12.5.4 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support **command generation and** telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry, **and the transmission of commands to JSC. PRS will also interface with** ESS, STScI, and PASS for **nominal engineering data flows and data analysis as defined in the test procedure**.

D.12.5.5 Johnson Space Center. JSC support will include providing hazardous command checking at the MCC-H, telemetry proceasing, SSE command generation, and **communicate with GSFC as expected during SM2.**

D.12.5.6 Kennedy Space Center. KSC will provide an Orbiter to receive HST telemetry from the HST PSS via HST RF Sim rack to the Orbiter PI. Also, to execute HST commands from the AFD to the HST PSS via the Orbiter PI and HST RF Sim rack. **SSE telemetry, interfaces, and commands will be executed with the SSE flight hardware and the Orbiter.**

D.12.5.7 Institutional Support. Institutional support will include SPIF for telemetry processing and JSC interfacing, and NASCOM for data lines between facilities. The SOC will provide a PSS and RF Sim rack at KSC.

D.12.5.8 Merritt Island Launch Annex. MILA will provide equipment to support a direct TDRSS interface from KSC to the SN.

D.12.7 Duration

ETE-2 will consist of a single 6 hour test session.

D.12.8 Dependencies

Dependencies for this test include:

- IPA-1 JSC telemetry test
- IPA-2 JSC hazardous command check test
- PDT-1 AFT Deck TLM/CMD test
- PDT-2 CITE interface test

- PDT-3 MILA/GSFC GSE testing
- ETE-1 CITE end-to-end
- SMGT-22 ground system (SR#3) test

D.12.9 Schedules

These are the planned dates for ETE-2 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 9/6/96
- Test Plan/Procedure (Final)..... 9/20/96

- Testing..... 1/30/97

- Test Report (Draft)..... 2/7/97

- Test Report (Final)..... 2/14/97

D.13 End-To-End-3 (ESTL/SAIL Test)

This section provides detail information on the End-To-End-3 (ESTL/SAIL Test).

D.13.1 Purpose

ETE-3 is an end-to-end test which will verify the HST (Simulated) S-band and Ku-band telemetry processing links to the HST POCC, using STGT.

D.13.2 Objectives

This ESTL testing is the first ETE checkout of the Ku-band and S-band telemetry link. This HST telemetry path is planned to be used during the SM2.

- Telemetry:
  - 500 bps S, 4 Kbps D/A, 32 Kbps T/H engineering data(Ku-band and S-band)
  - 4 Kbps DF224 dump data (Ku-band and S-band)
  - 1MB ETR, STR, R/T science, NSSC-1 dump data (Ku-band only)

D.13.3 Activities

This test will exercise the links previously tested locally at JSC with the entire SN and GSFC and JSC ground systems to verify for the first time the systems to be used for SM2.

Refer to Figure D-12 for an illustration of the ETE-3 test configuration.

D.13.4 Roles and Responsibilities

This section identifies the End-To-End-3 (ESTL/SAIL Test) roles and responsibilities.

D.13.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in any data analysis.

D.13.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

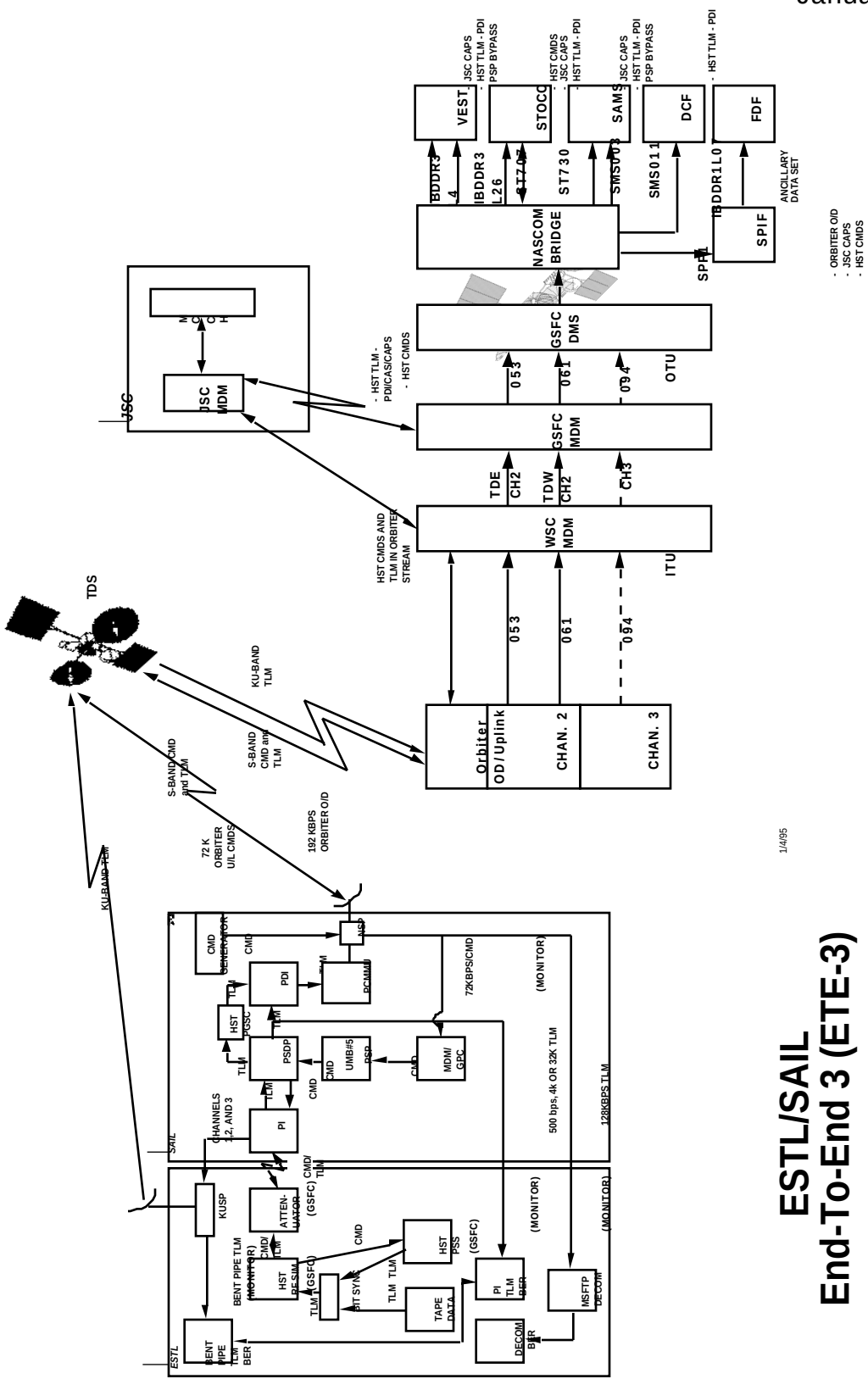

Figure D-12. ETE-3 Configuration

D.13.4.3 Johnson Space Center. JSC support for ETE-3 will include providing personnel to schedule, operate, prepare test procedures, configuring data lines, manning the consoles at JSC and data analysis at the MCC-H, ESTL and SAIL facilities. JSC personnel will be responsible for all test activities involving JSC facilities.

D.13.4.4 Institutional Support. Institutional support for ETE-3 will include SN for providing personnel to support telemetry processing, procedure reviews, data analysis and troubleshooting data lines between facilities.

D.13.4.5 Code 441/510/515. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the HST operational scenarios for SM2. Code 510 will assist in preparing HST test procedures, coordinating HST personnel and equipment, and analysis of the HST data. Also, personnel to provide leadership and technical expertise for test activities involving HST specific items. Code 515 will provide personnel to operate the PSS and RF Sim Rack, following the test conductor's directions.

D.13.4.6 Packet Processor II. Personnel will assure the engineering data collected in parallel does not interfere with on-going operations and will provide data analysis.

D.13.5 System/Facility Requirements

This section identifies the End-To-End-3 (ESTL/SAIL Test) hardware and software. (See Table D-13).

Table D-13 ETE-3 **Facilities**

ETE-3 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
PACOR II	BLDG. 23	TEST SYSTEM PACKET PROCESSOR
PRS	STOCC/MOR	PRS ON-LINE SYSTEM
JSC	ESTL/SAIL	MISSION CONFIG. CODES
INSTITUTIONAL SUPPORT	NASCOM/TDRSS	SM2 MISSION SOFTWARE
NASA/GSFC/CODE 441/442	STOCC/VEST	PRS/PASSOPS/VEST

D.13.5.1 S**pace Telescope Operations Control Center**. The STOCC is the responsibility of the FOT. **Consoles, voice loops and interfaces to NASCOM will be available for this test. Equipment, data lines, and consoles for data analysis will be provided in the ESS and PASS areas.**

D.13.5.2 **Space Telescope Operations Control Center/Data Operations Center**. The STOCC/DOC will provide the ground system **equipment**, interface with NASCOM data lines **and voice lines**. The STOCC/DOC will be responsible for all HST ground system equipment.

D.13.5.3 Packet Processor II. The PACOR II system located in building 23 will monitor and collect the engineering data in parallel **without** interfering with on-going operations. If the engineering data is need**ed** for data analysis PACOR II will be

notified by the test conductor. PACOR II will also provide block level data quality monitoring in real-time.

D.13.5.4 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support **command generation and** telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry, ESS, STScI, and PASS for the transfer of engineering data. The PRS systems in SAMS, STOCC, and VEST will be utilized for this testing.

D.13.5.5 Johnson Space Center. JSC support will include providing telemetry processing, **and communications with GSFC as expected during SM2. This is to include** SN interfacing **for the Ku-band and S-band systems from ESTL.**

D.13.5.6 Institutional Support. Institutional support will include SPIF for telemetry processing and NASCOM for data lines between facilities. The SOC will provide a PSS and RF Sim rack at JSC.

D.13.6 Duration

ETE-3 will consist of a single 8 hour test session.

D.13.7 Dependencies

Dependencies for this test include:

- PGSC interfaces

- STGT support of HST low rates
- MCC-H support of PGSC S-band data rates

D.13.8 Schedules

These are the planned dates for ETE-3 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft)..... 12/15/95
- Test Plan/Procedure (Final)..... 1/26/96

- Dry Run (p/b to STOCC)..... 12/15/95
- Test Window..... 2/1/96-4/1/96

- Test Report (Draft)..... 4/15/96
- Test Report (Final)..... 4/29/96

D.14 End-To-End - 4 (Mission Readiness Testing)

This Section provides detail information on the End-To-End - 4 (Mission Readiness Testing).

D.14.1 Purpose

This testing is the verification of the DSN and GN sites supporting the SM2 and operations after SM2.

D.14.2 Objectives

The test will verify the hardware and software at each site with the STOCC. Simulated HST and recorded HST data tapes will be used to provide a checkout of the telemetry processing at GSFC.

- Command:
  - HST commands 1000 bps
- Telemetry:
  - All engineering data rates and formats
  - DF-224, NSSC-1, and ETR dumps.

D.14.3 Activities

This test session will ensure that all DSN sites have been verified to support the SM2 activities and post mission activities. This test will be repeated at each site for each shift of personnel to provide training of remote DSN and JPL personnel on SM2 support configurations.

Refer to Figure D-13 for an illustration of the ETE-4 test configuration.

D.14.4 Roles and Responsibilities

This Section identifies the End-To-End - 4 (Mission Readiness Testing) roles and responsibilities.

D.14.4.1 Space Telescope Operations Control Center. The FOT, located in the STOCC, will assure that on-going operations are not interrupted by the testing. The FOT will also provide personnel to man the consoles and to assist in any data analysis.

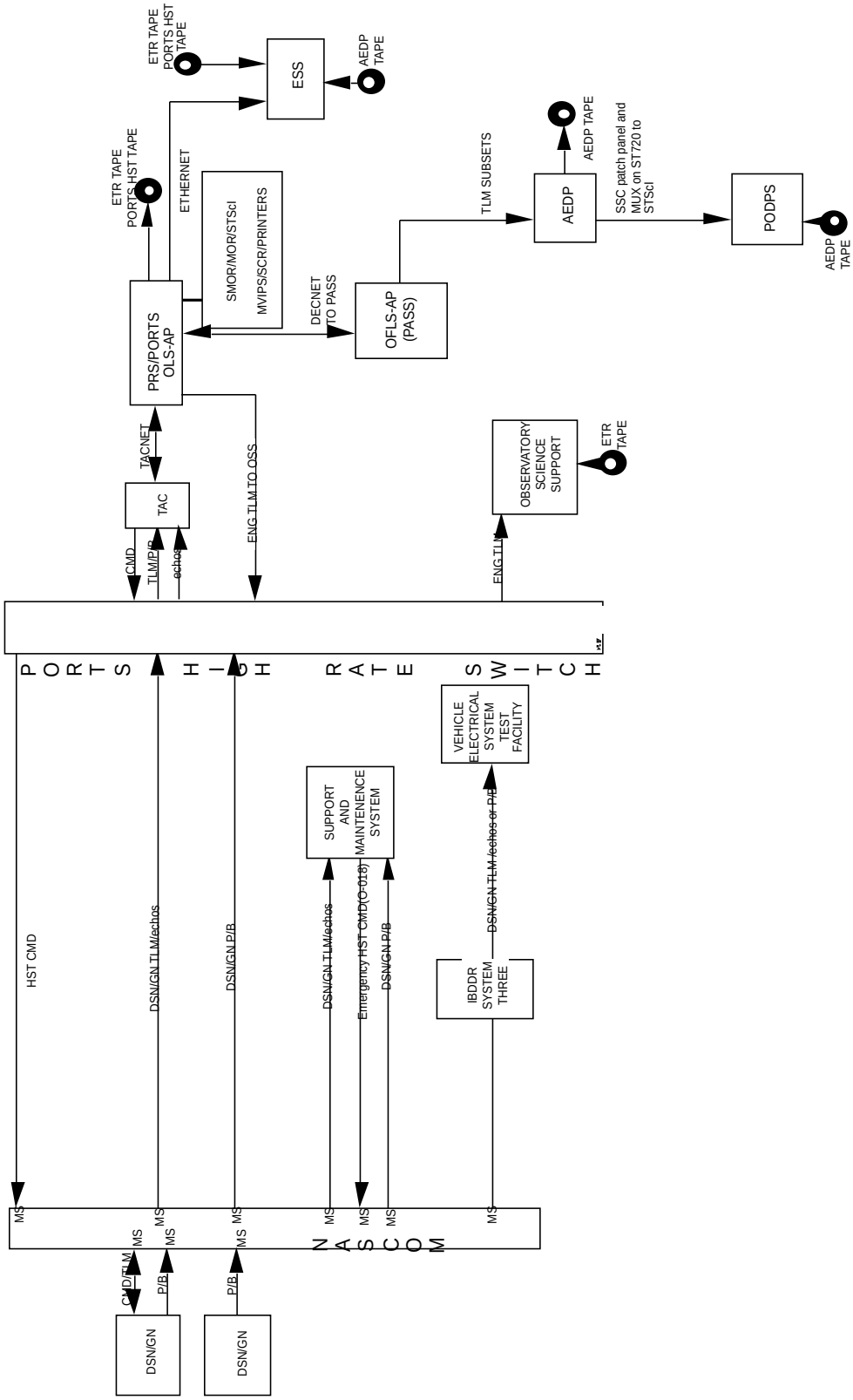

Figure D-13. ETE-4 Configuration

D.14.4.2 Space Telescope Operations Control Center/Data Operations Center. The STOCC/DOC will provide personnel to configure the ground system, interface with NASCOM to configure the data lines, and to assist in troubleshooting activities at the direction of the test conductor. The STOCC/DOC will be responsible for all HST ground system equipment.

D.14.4.3 Institutional Support. Institutional support will include NASCOM for data lines between facilities. The DSN sites will provide personnel to support data flows to the STOCC. JPL will coordinate resources and test activities. Also, Code 510 personnel to provide leadership and technical expertise for test activities involving HST specific items.

D.14.4.4 Code 441/510. Code 441 will provide personnel to assist in data analysis and to assure the testing meets the HST operational scenarios for SM2. Code 510 will assist in preparing test procedures, coordinating HST personnel and equipment, and analysis of the data. Also, personnel to provide leadership and technical expertise for test activities involving HST specific items.

D.14.5 System/Facility Requirements

This Section identifies the End-To-End - 4 (Mission Readiness Testing) hardware and software.(See Table D-14).

Table D-14. ETE-4 **Facilities**

ETE-4 TESTING SUPPORT: ELEMENTS/FACILITIES		
ELEMENT	FACILITIES	HARDWARE/SOFTWARE
STOCC	MOR/SEER/ESS	PRS
STOCC/DOC	DOC	APs/MVIPs/TTACs/COMM
INSTITUTIONAL SUPPORT	NASCOM/DSN	SM2 MISSION SOFTWARE
NASA/GSFC/CODE 441	STOCC/VEST	PRS/PASSOPS

D.14.5.1 Space Telescope Operations Control Center. The STOCC is the responsibility of the FOT. Consoles, voice loops and interfaces to NASCOM will be available for this test.

D.14.5.2 **Space Telescope Operations Control Center/Data Operations Center.** The STOCC/DOC will provide the ground system **equipment**, interface with NASCOM data lines **and voice lines**. The STOCC/DOC will be responsible for all HST ground system equipment.

D.14.5.3 PORTS Refurbishment System. The PRS system will be required to support test activities. PRS will be configured to support telemetry receipt. PRS will interface with NASCOM for the receipt of engineering telemetry **and commands to each DSN site.**

D.14.5.4 Institutional Support. Institutional support will include NASCOM for data lines between facilities. The DSN sites will provide simulators to support data flows to the STOCC.

D.14.6 Duration

ETE-4 will consist of a 4 hour test sessions which will be run multiple times (once for each shift per site)

D.14.7 Dependencies

Dependencies for this test include:

- SM2 'T' format tapes to each site

D.14.8 Schedules

These are the planned dates for ETE-4 activities, refer to the most recent version of the O&GS Project Schedule.

- Test Plan/Procedure (Draft) 10/11/96
- Test Plan/Procedure (Final) 11/1/96

- Test (All stations) 1/3/97-1/24/97
- Test (Canberra) 1/10/97
- Test (Goldstone) 1/17/97
- Test (Madrid) 1/24/97

- Test Report (Draft) 2/3/97
- Test Report (Final) 2/8/97